


# **Telehealth Delivered Voice Therapy: Comparing Outcomes to Traditional Delivery for Adults with Parkinson's Disease**

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# Introduction

Accessing speech therapy services for chronically ill, older adults, and people living in remote areas may be constrained by transportation needs and time (Lacy, Paulman, Reuter, & Lovejoy, 2004).

Videophone delivered therapy has the potential to promote the same speech and language treatment as face-to-face treatment (Gutierrez, 2001).

The equality of treatment outcomes under conditions of remote delivery compared to traditional delivery has not been tested.

# Telehealth Technology & Rehabilitation

- Audio, video, and other telecommunications can be transmitted over telephone and fax machines, interactive video, the Internet, World Wide Web, and e-mail in order to provide treatment (Gutierrez, 2001).
- Early projects using telehealth technologies focused on providing medical consultations to rural and prison settings (Darkins & Cary, 2000; Maheu, Whitten, & Allen, 2001).

- Application of telehealth technology, has traditionally been the domain of physicians and the academic medical community, but has recently moved to nontraditional settings such as rehabilitation (Friedewald & Pion, 2001).

# Telehealth & Speech-Language Pathology

- Studies of the use of telehealth technology to deliver speech and language services have historically focused on assessment. (Georgeadis, Brennan, Barker, & Baron, 2004; Lemaire, Boudrias, & Greene, 2001; Mashima, Birkmire-Peters, & Holtel, 1999; Nakamura, Takano, & Akao, 1999; Wertz et al., 1987; Wertz et al., 1992).
- A few studies have investigated treatment outcomes and results indicated that this is an effective method of delivery of speech services (Kully, 2000; Sheidemann-Miller et al., 2002, Theodoros et al., 2006 ).

# Speech Technique for Testing

- Prescriptive treatment
- Proven outcomes
- Videophones would be the only difference in delivering therapy

# **Lee Silverman Voice Treatment (LSVT) (Ramig et al., 1995)**

- Clinicians are trained and certified
- Proven outcomes for individuals with Parkinson's disease over 15 years

# Speech Disorders Associated with IPD

- Monoloudness
- Monopitch
- Articulation Disorders
- Decreased Intensity

# Success of LSVT depends on ...

- Intensity of treatment (4Xweekly for 4weeks)
  - Overlearning a new motor task (Astrand & Rodal, 1970)
  - Repetition to improve automatacity (Brown & Marsden, 1991)
- Sensorimotor training
  - Sensory awareness of internal cue (Fox et al., 2002)
- Neuroplasticity
  - Recovery of brain damage (Liotti, et al., 2003)
  - Basal ganglia activity increases
- Structural changes
  - Improved glottal competence (Marshall et al., 1995)

# **Due to intensity of treatment access to LSVT can be limited by**

- Mobility problems
- Access to certified clinicians
- Living in remote areas
- Transportation difficulties
- Dependence on caregivers

# **Videophone-delivered LSVT is attractive, but.....**

- Can we achieve similar outcomes as traditional face-to-face therapy?
- Can we save transportation costs?
- Can we relieve caregiver burden?
- Will participants increase perceptions of empowerment?
- Will clients be satisfied with this type of service delivery?

# Purpose of The Study

- Test the differences in outcomes for clients served using videophone delivered voice therapy vs. traditional methods by comparing results of this study to the Ramig et al.(2001) study
- Examine cost benefit associated with videophone delivery of therapy.
- Examine effects on perception of caregiver burden
- Examine client satisfaction

# Methods

- The design of this study was a phase II (Robey & Shultz, 1998) pre- post measures design. The independent variable was the Lee Silverman Voice Treatment (LSVT®) delivered via videophones.
- The dependent variables included pre and post measures of intensity in decibels (dB) of vowel prolongation, reading passage, monologue, and picture description with comparisons to previously published study (Ramig et al., 2001)

- Perception of burden by caregivers was measured with an investigator developed instrument.
- A cost benefit analysis was also calculated by comparing the cost of videophone delivered voice therapy to face-to-face delivery for participants.
- Participant's perception of use of videophones to deliver voice therapy was measured with the Telemedicine Satisfaction Questionnaire (TSQ).

# Participants

- Twenty four individuals with idiopathic Parkinson's disease (IPD) were recruited from the Department of Veterans Affairs Medical Center (VAMC) and the University of Kentucky Medical Center (UKMC)
- Eleven Primary caregivers were also enrolled in this study

# Inclusion Criteria

- IPD
- Age 55-78
- No vocal pathology that would contraindicate LSVT
- A score of 24 or above on MMSE
- A score of 85% or better on CID sentences

# Measures

- Vocal Intensity
- Caregiver Burden
- Client Satisfaction
- Cost-Benefit Analysis

# Vocal Intensity

- Loudness measured in decibels (dB)
  - Prolonged vowel
  - Reading passage
  - Monologue
  - Picture description

# Caregiver Burden

- Vital role in caring for chronically ill individuals (Grunfeld et al., 2004)
- Burden and economic impact on caregivers is poorly understood
- Researcher developed structured interview

# Client Satisfaction

- Client satisfaction with videophones
  - TSQ (Yip et al., 2003)

# Cost-Benefit Analysis

- Cost benefit to participants
- Comparison of videophone visit to traditional visit
- Amount of time and money involved

# Baseline and Post-Treatment

- Baseline measures were obtained in a sound treated booth using a hand held Radio Shack Sound level meter (SLM)
- Participants produced /a/ for 6 trials; these were averaged
- Read the “Rainbow Passage” the SLM averaged the dB of the paragraph
- Produced a 1-minute monologue
- Described the “Cookie Theft” picture

# A Typical LSVT Session

- Maximum duration of sustained /a/ 15 times
- Glide to highest note 15 times
- Glide to lowest note 15 times
- Read 10 functional phrases 5 times each
- Read words/ phrases, sentences, paragraphs, conversation



# KMEA TV500SP Videophone

Uses plain old telephone service (POTS)  
and  
electricity

# Comparison of Ramig et al. (2001) and Tindall et al. Groups

	Ramig et al.	Tindall et al.	Diff	T value	P value
N	14	24	10		
Age	67.9(9)	70.5(8.5)	2.6	1.49	<0.15
Time p/o	8.6(6.3)	3.2(1.5)	-5.4	-17.25	<0.01

# Comparison of Pre-treatment means of vocal intensity (dB)

Task	Ramig et al.	Tindall et al.	Diff	P value
/a/	69.1(5.1)	70.7(4.4)	-1.6	<0.09
Read	71.3(3.2)	69.6(3.3)	1.7	<0.03
Mono	69.0(4.6)	67.8(4.1)	1.2	<0.20
Pix	68.9(4.6)	67.2(4.9)	1.7	<0.12

# Mean change in vocal intensity (dB) after treatment (Tindall et al.)

Task	Pre dB	Post dB	Mean diff	DF	T value	P value
/a/	70.7(4.4)	84.0(6.0)	13.3(4.4)	23	14.9	<.01
Read	69.6(3.3)	75.5(4.1)	5.8(3.3)	23	8.4	<.01
Mono	67.8(4.1)	71.5(4.1)	3.6(2.9)	23	6.0	<.01
Pix	67.2(4.9)	73.9(3.2)	5.9(4.6)	23	6.2	<.01

# Mean Change of Vocal Intensity (dB) Post Treatment of Ramig et al. Group

Task	Pre dB	Post dB	Mean Diff	P value
/a/	69.1(5.1)	82.4(3.9)	13.3	<.01
Read	71.3(3.2)	77.9(4.2)	6.6	<.01
Mono	69.0(4.6)	74.4(4.0)	5.5	<.01
Pix	68.9(4.6)	74.4(4.3)	5.4	<.01

# One-Sample $t$ Test Comparing Mean Change in Vocal Intensity (dB) of Tindall et al. to Ramig et al.

Task	Ramig et al.	Tindall et al.	DF	T value	P value
/a/	13.3(6.4)	13.4(4.4)	23	.08	.<93
Read	6.6(5.2)	5.8(3.3)	23	-1.13	<.27
Mono	5.5(5.4)	3.6(2.9)	23	-3.12	<.01
Pix	5.4(6.3)	5.9(4.6)	23	5.5	<.59

# Telemedicine Satisfaction Questionnaire

- High levels of satisfaction on 14 items  
Using a 5-point scale:

1=strongly disagree, 2= somewhat disagree,  
3=undecided, 4=somewhat agree, 5=strongly agree

# Highest scores

My healthcare provider understands my condition  
(4-5)

I feel comfortable communicating with my  
healthcare provider (4-5)

Videophones save me time traveling to a hospital  
or clinic (4-5)

# Lowest scores

I can easily talk to my healthcare provider (2-5)

I can hear my healthcare provider clearly (2-5)

I do not receive adequate attention (1-5)

# Perception of Caregiver Burden

	Average	Range	Average cost of 16 sessions
Round trip mileage	93 miles	.5 to 200 miles	1488 miles
Time off from work	5.8 hours	2.5 to 10 hours	92.8 hours
Time involved in a speech therapy visit	3 hours	1.5 to 5 hours	48 hours
Dollar amount per visit	\$94.00	0 to \$400.00	\$1504.00
Other costs per visit	\$20.00	\$15.00 to \$35.00	\$ 320.00

# Cost Analysis Videophone vs. Traditional

Type of Delivery	N	Mean Mileage	Mean Time (hours)	Mileage Cost	Other
Videophone per visit	20	0	1	0	0
16 visits		0	16	0	0
Traditional per visit	20	125.1 (.5 -300) (round trip)	3.2 (1.5- 5)	\$59.57 (\$.24-144.00)	\$16.80 (\$6.00-35.00)
16 visits		2001.6	51.20	\$953.00	\$268.80

# Conclusions

- Videophone-delivered LSVT is effective therapy for individuals with IPD
- Videophone-delivered voice therapy represented a significant cost saving for participants
- Videophone-delivered voice therapy eased the burden of care
- Participants were highly satisfied with this type of service delivery

# Limitations of the Study

- Absence of a true control group
- Investigator bias
- Asynchronous audio and visual signal of videophones at times

# Future Considerations

- Continue to research efficacy of videophone treatment
- More comparison studies
- Cost analysis of savings to the facility